

Introduction to the Ecology of the Arima Valley, Trinidad, B.W.I.<sup>1</sup>

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(Plates I-V; Text-figures 1-5)

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## I. INTRODUCTION

THE object of this paper is to deal briefly with various ecological aspects of the Arima Valley, Trinidad, the location of a research field station of the New York Zoological Society. The valley lies in the middle of the Northern Range, an area which includes large stretches of undisturbed forest reserve. The property which has recently been acquired there for the Zoological Society comprises 200 acres and includes the neighboring estates of Simla and St. Patrick. Buildings on the former have been equipped to serve as a practical laboratory for research in tropical ecology and animal behavior.

Throughout all the first three seasons of occupancy, our endeavors have been made possible by the sympathetic and intelligent cooperation of all branches of the Trinidad Government and of innumerable civilian friends. His Excellency the Governor Sir Hubert and Lady Rance have given freely of their interest and help.

In special departments, our appreciation goes particularly to Mr. A. T. Shill and his staff of Her Majesty's Customs for their courtesy in the entry of our scientific equipment; to Mr. Ludolf Wehekind of the Department of Works and Hydraulics for the loan of rain-recording instru-

ments and for assistance in many other ways; to Mr. A. F. A. Lamb, the Conservator of Forests, for his close cooperation, and to Mr. Ray Johnson of the Cartographical Department for his aid with government maps.

The Imperial College of Tropical Agriculture has placed its library, study collections and other facilities at our disposal. In addition, we wish particularly to thank Dr. T. W. Kirkpatrick, Dr. F. J. Simmonds, Major R. Senior-White and Dr. Angus Simmons.

We also appreciate heartily the friendly assistance of members of the Caribbean Commission, of the American Consulate and of successive commanders of the United States Naval Base. We are indebted to the United States Weather Bureau in Washington for the loan of meteorological instruments. To Mr. John Probst and the Trinidad staff of Pan-American World Airways go our thanks for expediting the safe and rapid shipment of live animals.

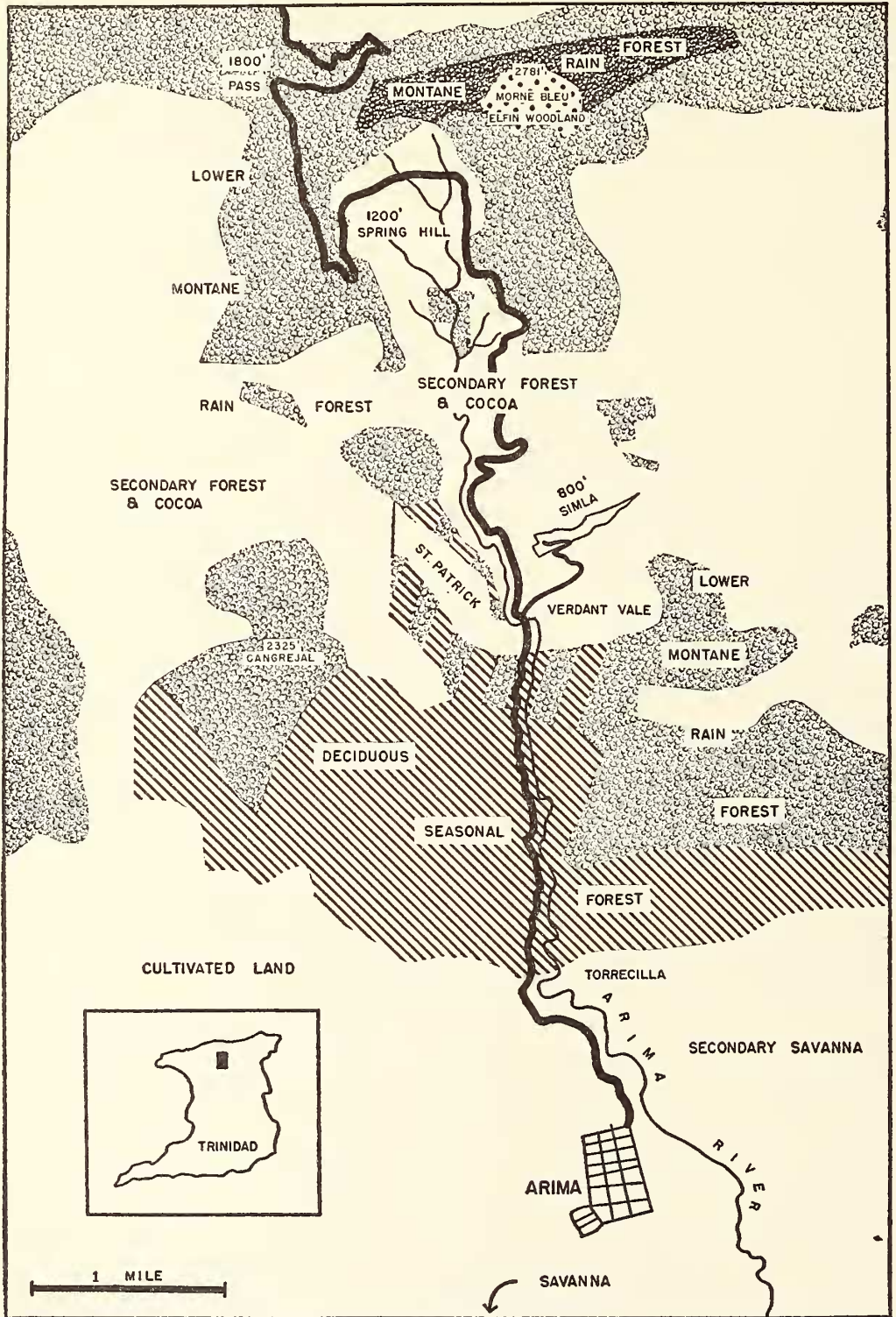
The generous cooperation of the Alcoa Steamship Co., through President W. C. White and Vice-president F. K. Bell in New York and Mr. Edward Collins in Trinidad, has placed us of the New York Zoological Society under a host of obligations.

Very special mention must also be made of the constant friendly help of our neighbors in the Arima Valley, Dr. and Mrs. H. Newcome Wright and Squadron Leader and Mrs. John A. Carmichael.

I gratefully recognize the assistance of Mr. Charles M. Bogert, Dr. James A. Oliver and Mr. Edwin McConkey in the identification of amphibians and reptiles.

Finally, thanks are due members of my staff, including Jocelyn Crane, Henry Fleming and Ellen Ordway, for insect data and for recording and compiling the meteorological and phenological data presented in the following pages.

<sup>1</sup> Contribution No. 927, Department of Tropical Research, New York Zoological Society.



TEXT-FIG. 1. Arima Valley, to show general biotic zones. Forest Reserves are shaded, their boundaries approximate. Physical boundaries of valley, north of Arima, include approximately the vertical middle third of this map. See Plate I for contour lines and Pl. V for airplane view.

## II. LOCATION

Simla, the permanent Field Station of the Department of Tropical Research of the New York Zoological Society, is situated in the north-central mountains of the island of Trinidad, British West Indies. Trinidad itself is a small rectangular chip close to the northeast shoulder of South America. Geologically and biologically, Trinidad and its small sister island of Tobago are typically South American.

Trinidad measures roughly 30 by 50 miles with extensive peninsulas projecting from three of the four corners. It contains a total of 1,862 square miles, which makes it slightly larger than Rhode Island and somewhat smaller than Lancashire. Trinidad is just north of the delta of the Orinoco, separated from the continent by the Gulf of Paria. At the north and south limits of the gulf the insular peninsulas extend to within eight miles of the Venezuelan coast.

The Field Station as a whole consists of the Simla estate of 22 acres, and the adjoining estate of St. Patrick of 176 acres. Simla Laboratory is four miles by road north of the town of Arima, in the southern third of the Arima Valley on the Blanchisseuse Road. Its geographical position is North Latitude  $10^{\circ} 41' 1''$ , and West Longitude  $61^{\circ} 17'$ . Its elevation above the sea is almost exactly 800 feet.

Simla's geographical relationship to the locations of former stations of the department covers relatively short distances: the two Venezuelan stations, Caripito and Rancho Grande, are, respectively 100 and 400 miles to the west (Beebe, 1942; Beebe & Crane, 1947), while Kartabo, British Guiana, lies 350 miles to the southeast (Beebe, 1925).

The Northern Range is composed of Jurassic and Cretaceous rocks. These were probably folded in the Middle Eocene. Since then erosion has been proceeding steadily. Omitting the three westernmost drowned valleys which are now marked only by open waterways in the Dragon's Mouth, the southern slopes of Trinidad's northern mountains are furrowed by 15 more or less parallel valleys each with its respective river or stream flowing along its floor. The Arima is about the center of these tumbled ranges, and ends at the northern end of the valley in a blind gorge. The river's opposite fellow, on the northern slope, is the Marianito, which flows north and empties into the Marianne. This in turn flows into the Atlantic at the little village of Blanchisseuse.

## III. METEOROLOGY

### A. General Weather Conditions

In spite of its varying altitude, the general

climate of the Arima valley is moist and tropical throughout. Between the seasonal forest of its nearly sea-level southern end and the lower montane rain forest of the 1,800-foot northern Pass, there is of course climatic variation. However, rainfall records from three stations, covering three to five years, give averages ranging from only 102 to 121 inches (2,591 to 3,073 mm) per year, although the stations' range in altitude is from 200 to 1,200 feet. No station has yet been established at the 1,800-foot Pass.

Temperature, humidity and sunshine records are known only for Simla during parts of two years, but are probably typical of the valley, its geographical position, at 800 feet, being about midway between the mouth and the Pass. Here the monthly temperature, including parts of both wet and dry seasons, averages in the middle and upper seventies, the percentage of humidity in the upper seventies and throughout the eighties, and the sunshine from more than three to less than eight hours daily. At the Pass itself a considerable decrease of temperature and sunshine and an increase of rain and humidity is of course highly probable. There we would expect an approach to the Rancho Grande climate, although the altitude is only one-half that of the Venezuelan location. (See Beebe & Crane 1947, p. 49 ff.)

Table 1 gives general weather data for parts of the years 1951 and 1952, when the Simla Station was occupied. The periods included most of the dry and part of the wet seasons of each of the years. The comparison is of special interest, since these two seasons were among the wettest and driest, respectively, on record in the colony. They may be regarded therefore as the extremes of any weather likely to be met by future workers in the valley. Each of these years reflected conditions which prevailed throughout the southern Caribbean area. They are a reminder of the immense variation in tropical weather from year to year, and hence of the caution with which meteorological averages should be accepted in connection with the planning of ecological work. It will be seen that associated with the high rainfall of 1951 are, as would be expected, high humidity records, low temperatures and reduced sunshine.

Enveloping cloud or fog is practically unknown at Simla, although, as under similar conditions at Rancho Grande, it is prevalent on the mountains surrounding the valley and, more rarely, in pockets between the ridges.

### B. Rainfall

The year at Simla, as in Trinidad as a whole, is divided into only two seasons, dry from Jan-

TABLE 1. WEATHER AT SIMLA, ARIMA VALLEY, TRINIDAD, FEBRUARY-JUNE, 1951 AND 1952

	February		March		April		May		June	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Average Temperature	73.9 F 23.3 C	75.7 F 24.3 C	74.4 F 23.6 C	76.5 F 24.7 C	75.5 F 24.2 C	77.7 F 25.4 C	75.9 F 24.4 C	78.5 F 25.8 C	74.8 F 23.8 C	77.6 F 25.3 C
Average Humidity, %	89.0	77.1	83.9	76.7	82.7	77.1	86.6	80.7	82.8	81.2
Rainfall	12.1 in. 307.3 mm	1.4 in. 35.6 mm	5.4 in. 137.2 mm	1.5 in. 38.1 mm	3.1 in. 78.7 mm	1.4 in. 35.6 mm	12.6 in. 320.0 mm	3.6 in. 91.4 mm	14.7 in. 373.4 mm	12.2 in. 309.9 mm
Number of Sunless Days	5	None	None	None	None	1	2	1	6	2
Number of Rainless Days	3	14	12	16	17	21	8	17	4	3
Approximate Number of Hours of Sunshine	119	223	109	226	184	212	117	171	104	152
Approximate Daily Average Hours of Sunshine	4¼	7¾	5¾	7¼	6¼	7	3½	5½	3½	5

uary to late May or early June, wet the rest of the year. There is, however, usually a "little dry season," the *petit carême*, in October. This is not nearly as pronounced as in British Guiana and elsewhere, but similar to that found in many parts of Venezuela. The rainy season in Trinidad usually begins a full month later than on the adjacent mainland. Text-fig. 2 shows that in the valley most rain falls in August and September, least in February and March.

Complete rainfall records are available for the Verdant Vale Estate, of which Simla used to be a part, for the years from 1935 to 1940. These are the only ones made so far for an equal period on the northern range. They are given in Text-figure 2 and Table 2. It will be seen that the six-year average was 108.1 in. (2,746 mm). For comparison, in the year 1951, the first half of which was extremely wet, the Simla total was 117.4 in. (2,982 mm). A three-year average at Torrecilla Estate (1949-1951), altitude 200 feet, was 101.83 in. (2,586 mm); at Spring Hill Estate for the same years, altitude 1,200 feet, 121.24 in. (3,079 mm).

Showers do not occur regularly at certain hours of the day or night. Except for the highly abnormal 1951, completely rainy, overcast days are very rare. The maximum rainfall occurring at Simla during 1951 and 1952, between February and June, was 2.76 in. (70.1 mm). It fell on February 10, 1951, a date which normally is well into the dry season.

Rainless days during the seasons at Simla ranged from three in February of 1951 to 21 in April of 1952. The total for the year 1951 was 85, in contrast to 133 for the five-year Verdant Vale average.

A government rain gauge was established at Simla, thanks to Mr. Ludolf Wehekind of the Department of Works and Hydraulics. During the months when Simla was unoccupied, the records of Mr. J. A. Carmichael are used. The site of his instrument is on a ledge opposite, immediately adjacent to Simla to the south, at an altitude of about 650 feet, approximately 400 yards across a ravine, and in plain sight of the Simla gauge. Variations in the monthly rainfall totals in the two localities are negligible, although moderate differences sometimes occur in the daily totals.

### C. Humidity

As will be seen from Table 1, the average humidity per month varied, in the two years during our occupancy of Simla, from 77.1 to 89%. The saturation point was reached almost every night and sometimes was maintained throughout most of the period of darkness.

TABLE II. RAINFALL RECORDS AT VERDANT VALE (1935-40) AND SIMLA (1951 ONLY)

	Verdant Vale Estate 1935-1940 5-year Average		Simla 1951 Only	
	January	4.79 in.	(121.7 mm)	8.79 in.
February	2.65 in.	( 67.3 mm)	12.05 in.	(306.1 mm)
March	2.99 in.	( 75.9 mm)	5.41 in.	(137.4 mm)
April	3.77 in.	( 95.8 mm)	3.13 in.	( 79.5 mm)
May	7.87 in.	(199.9 mm)	12.57 in.	(319.3 mm)
June	10.86 in.	(275.8 mm)	14.70 in.	(373.4 mm)
July	13.19 in.	(335.0 mm)	15.53 in.	(394.5 mm)
August	16.20 in.	(411.5 mm)	8.95 in.	(227.3 mm)
September	14.50 in.	(368.3 mm)	11.89 in.	(302.0 mm)
October	8.30 in.	(210.8 mm)	7.77 in.	(197.4 mm)
November	12.55 in.	(318.8 mm)	10.82 in.	(274.8 mm)
December	10.43 in.	(264.9 mm)	5.79 in.	(147.1 mm)
TOTALS	108.10 in.	(2,745.7 mm)	117.40 in.	(2,982.1 mm)

Even during the height of the 1952 dry season, it was invariably in the upper nineties. The minimum ever reached was on March 1, 1952, with 43%. The usual monthly minimums hovered around 50% and were reached shortly after noon.

Through the cooperation of the U. S. Weather Bureau, a Friez hygrothermograph, model 594, was loaned us during 1951 and 1952. Typical weeks in the wet and dry seasons are reproduced in Text-fig. 3.

#### D. Temperature

Reference to Table 1 shows that the average temperature per month varied during the 1951-1952 seasons from 74.4° F (23.6° C) in March of 1951 to 78.5° F (25.8° C) in May of 1952. The usual daily extremes were, very roughly, from around 70° F (21.1° C) (several degrees above or below) before sunrise to the upper middle eighties (approximately 31° C) in the early afternoon. The maximum ever reached was 91° F (32.8° C) on May 23, 1952, between 12 and 1 PM, the minimum, 64° F (17.8° C) on March 30, 1951, between 5 and 7 AM. The highest minimum night temperature recorded was 77° F (25° C) on May 21, 1952, the temperature remaining steady between 6 PM and 1 AM; the lowest maximum day temperature was 73° F (22.8° C), on May 12, 1951, a very rainy day during which the temperature remained practically unchanged from 10 o'clock in the morning until midnight.

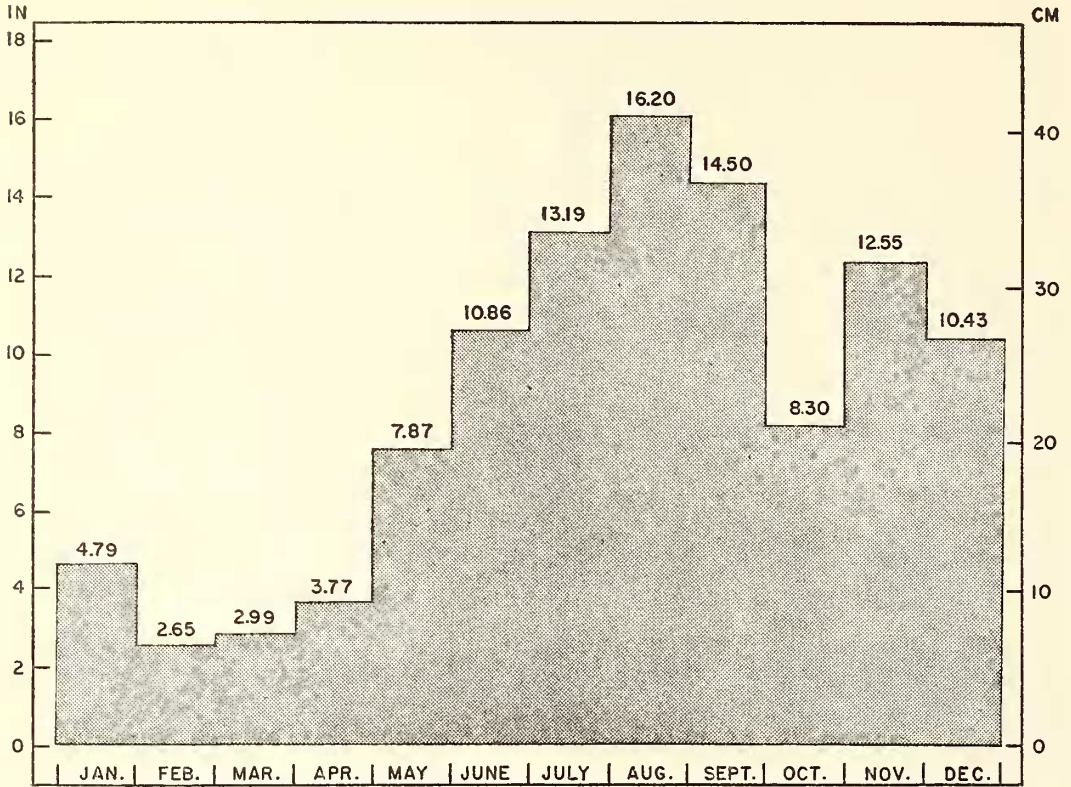
Typical weeks in the dry and wet seasons are reproduced in Text-fig. 3.

#### E. Sunshine

Sunshine data are given in Table 1. It will be seen that the total hours of sunshine per month during the recorded period varied from 103 to 226, or on the average from about 3½ hours daily to more than 7 hours. The fact that Simla is overlooked on east and west by mountain ridges reduces the theoretical 12-hour possibility of sunshine to between 9 and 10 hours. Days of full sunshine were practically non-existent. No definite differences were found between the tendency of maximum sunshine to occur in the morning or afternoon.

The instruments giving these data were loaned to us by the U. S. Weather Bureau. Two experimental models, one in 1951 and an improved version in 1952, were used; both were designed and developed by the Instrument Division. The instrument, known as the U. S. Weather Bureau Photoelectric Sunshine Switch, is designed to record only the periods during which the sun is shining, irrespective of relative intensity. Since, for our biological purposes, it was desired to record the hours of maximum diurnal flight activity of insects, the instrument was adjusted to record an impulse whenever the disk of the sun was sufficiently unobscured to cast an easily visible shadow.

Basically the sunshine switch consists of an instrument containing two photoelectric cells mounted in an open unshaded area, and a switch box to translate the impulses from the photoelectric cells to a register. The latter pens on a chart the minutes of sunshine or cloudiness. One particular merit of this apparatus is



TEXT-FIG. 2. Average rainfall at Verdant Vale Estate, close to the site of Simla, 1935-1940. (After data given in Beard, 1946).

that it is powered by a six-volt wet cell, making it completely independent of the conventional electric power systems seldom available in the field.

The record of a partly cloudy day, totalling  $4\frac{1}{2}$  hours of sunshine, is reproduced in Text-fig. 4. Because of the newness of the sunshine switch, no special record sheets have yet been printed for it, the Bendix 24-hour Wind Velocity Recorders being used with appropriate alterations of hour markings. The sheets were changed after sundown each night, rather than at noon, so that a continuous daytime record of sunshine is obtained on a single sheet. Every small step up or down indicates sunshine during that particular minute. Thus each upward and each downward series of five steps is counted as five minutes of sunshine.

#### F. Wind

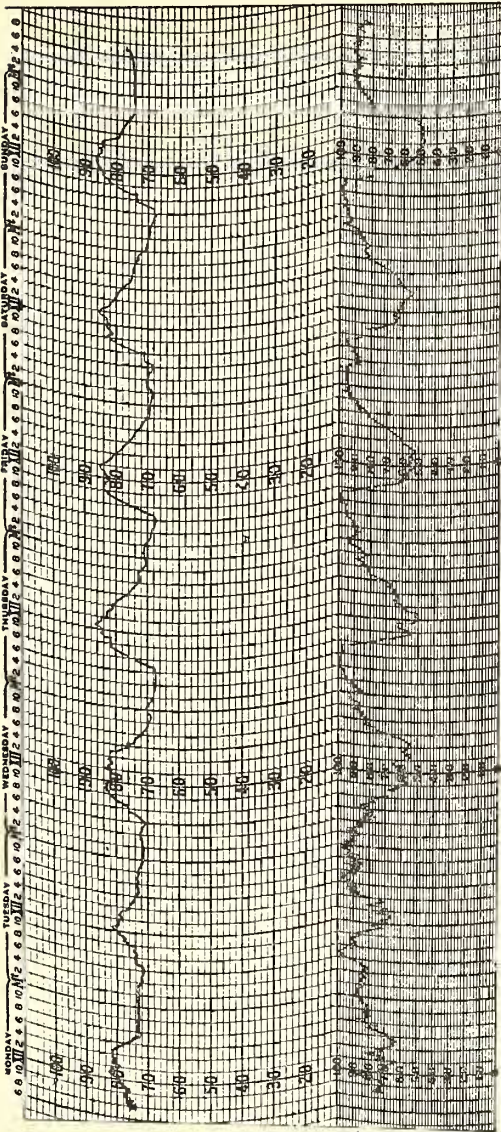
No wind records were made. As usual in mountainous country, the breezes are variable. The northeast trades are, however, distinctly noticeable as the prevailing wind, although the valley is at most times well protected from

their full strength, which is so apparent during the dry season on Caribbean coasts. Only rarely, usually around midday, does the wind become strong enough at Simla to be unpleasant.

#### IV. BIOTIC ZONES

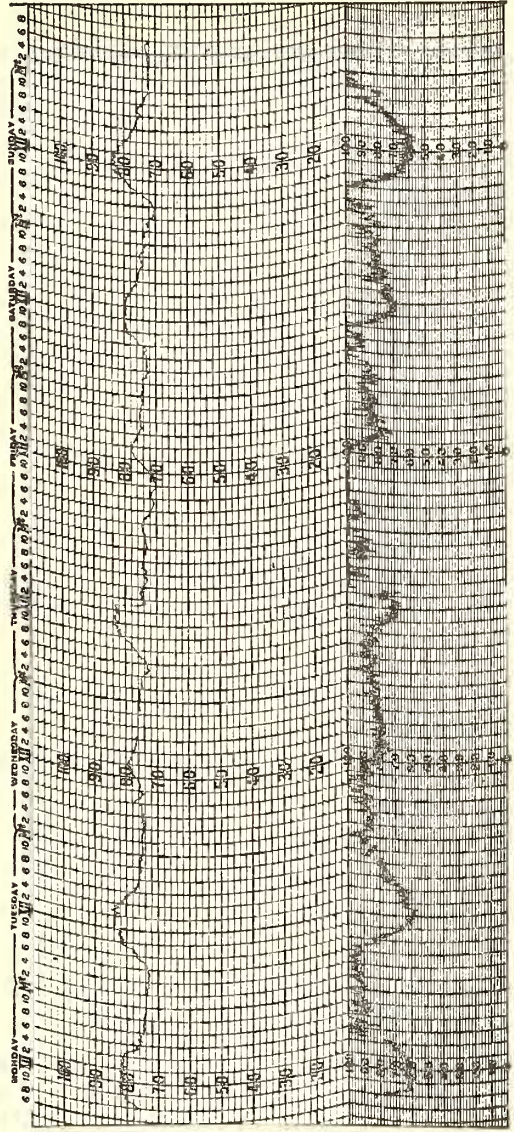
(Note: The concepts and terminology of Dr. John Beard, as given in the "Natural Vegetation of Trinidad" (1946) are used throughout this paper. Detailed accounts of all the following zones of vegetation will be found in that reference. See especially pp. 36-42 and 100-115. See Table 3 for systematic lists of botanical names used in this and the following section).

Although Rancho Grande in Venezuela is almost four hundred miles away to the west from Simla and the Arima Valley, yet the two places are strikingly alike in physical geographic features. There is a similar general succession of biotic zones from south to north, from low, dry savannas gradually up to a forested pass, and on down the north slope to the sea. The same jungle-bound, winding roads characterize each place, as also frequent neblinas or fogs and excessive humidity at the higher altitudes.



INSTRUMENT NO. .... STATION *Simla, Arima* DATE *Mar 9, 1952*  
*Trinidad, S.W.I.*

A



INSTRUMENT NO. .... STATION *Simla, Trinidad,* DATE *June 11/1951*  
*Simla*

REMARKS.....

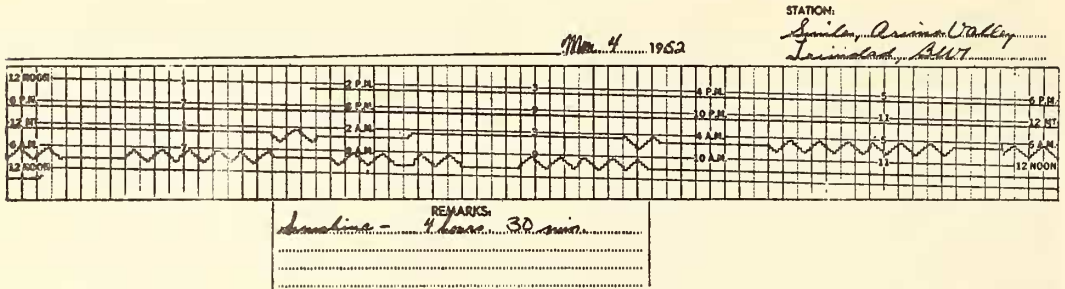
B

TEXT-FIG. 3. Hygrothermograph recordings of typical weeks at Simla, Arima Valley. A—Dry Season, March 2-9, 1952. B—Wet Season, June 11-18, 1951. In each case, the upper part of the chart records temperature in degrees Fahrenheit; the lower part, percentage of humidity.

The first zone south of the entrance of Arima Valley is savanna country characterized by poor and badly drained soil, covered with a general expanse of bunch grass dotted sparsely with chapparal (*Curatella americana*), serrette (*Byrsonima crassifolia*) and a few gnarled shrubs. Closer to the foothills, among secondary savanna resulting from destruction of the forest,

are cocorite palms (*Maximiliana elegans*), the hardy and prolific survivors of the original climax Seasonal Evergreen Forest Formation.

The Arima Wood Reserve in the foothills of the Northern Range consists of a transition to Lower Montane Rain Forest. It is composed primarily of Deciduous Seasonal Forest, a formation which has arisen following the destruc-



TEXT-FIG. 4. Recording of hours of sunshine on March 4, 1952, Simla, Arima Valley. For explanation, see text, p. 161. In reading the chart, the time of day is read from the notation below that of the graph: e.g. above, the first recording was at approximately 7:39 AM, the hour at which the sun appeared over the eastern ridge bounding the valley. Sunshine in the early morning and late afternoon is naturally curtailed by the surrounding mountains.

tion of original vegetation types. Beard describes the general characteristics of this zone as follows: "Tropical temperatures; not exposed to violent winds. Vegetation experiences drought equivalent on free draining soil without human interference to 5 months with less than 4 in. of rain each, of which 2 months have under 1 in. Available moisture 30-50 in. in total amount, derived wholly from precipitation. Human disturbance is active, causing desiccation of the habitat. Freedom from water logging and inundation.

"A highly discontinuous emergent layer at 40-60 ft. and an almost continuous canopy layer at 10-30 ft. Individuals per 100 acres, 15,000 over 1 ft., 50 over 6 ft., nil over 10 ft. girth. Lianas and epiphytes very scarce, buttressing absent, palms absent. One-half of the species and two-thirds of individuals in upper layer deciduous, one-tenth and one-quarter respectively in lower story. Leaves about 50 per cent mesophyllous, 50 per cent microphyllous, predominantly compound in upper story, simple in lower." (Beard, 1946, p. 39).

Yellow poui (*Tabebuia serratifolia*) is a prominent component, and during its extended, sporadic blooming during the dry season is an excellent diagnostic local guide to the extent of this type of forest.

Toward the northern end of the Arima Wood Reserve and on the heights of adjoining St. Patrick Estate, is found a most interesting transitional region. There has been apparently no interference from man, except for rare trail cutting and occasional, supervised lumbering; certainly these slopes have never been cleared. It has elements of both the Deciduous Seasonal Forest to the south and the Lower Montane Rain Forest of the higher altitudes to the east, north and west. In addition, however, it comprises a varied assortment of extremely local

characteristics, including patches of highly developed lianas, and dominants frequently showing both buttressing and low branching. These attributes are characteristic of Evergreen or Semi-evergreen Seasonal Forest rather than of either Deciduous Seasonal or Lower Montane. The floral composition does not, however, fit well into any of Beard's described Semi-evergreen Seasonal formations nor into his Transitional Seasonal Forest. It probably bears a close resemblance to the original cover of the foothills, where the climax Evergreen Seasonal Forest of the plains merged into the Lower Montane Rain Forest.

The undisturbed heights of most of the remainder of the valley are typical Lower Montane Rain Forest, almost all being included in the government's Forest Reserve. The general characteristics are as follows: "Sub-tropical temperatures. Evaporating ability of the air high due to exposure. No seasonal drought. Available moisture more or less evenly distributed throughout the year and over 70 in. in total amount. Freedom from waterlogging and inundation. Exposure causes variations from true rain forest type. Canopy is lowered to between 70 and 100 ft., but is closed at this level. No readily definable lower stratification. Average mature girth 7-8 ft. 16,000 trees over 1 ft. girth per 100 acres, 800 over 6 ft., and 80 over 10 ft. Dominants have long, thin, clear boles. Lianas and epiphytes poorly developed. Palms very rare. Ferns abundant but only small tree-ferns. Buttressing not a character. 100 per cent evergreen, leaves simple, mesophyllous, shiny and slightly leathery. Ground vegetation extremely sparse. Rich tree flora." (Beard, 1946, pp. 41-42). However, in certain pockets of specially favorable exposure and humidity, epiphytes and tree-ferns become the equal of those in the Montane Rain Forest of Rancho Grande.



On the highest slopes and ridges in very limited localities occur patches of true Montane Rain Forest. Its general characteristics are described as follows: "Temperate climatic conditions. Evaporating ability of the air high. No seasonal drought. Available moisture very high in amount, derived both from precipitation and from mist-condensation. Canopy 60 ft., much wind-damaged. Lower stratum 20-40 ft. and under story of tree-ferns and small palms. Average mature girth 4-5 ft., 11,000 trees over 1 ft. girth per 100 acres and 100 over 6 ft. Trees are branching and of bad form. Lianes very abundant, epiphytes tremendously luxuriant. Only small-stemmed palms, but abundant, and several species of large tree-fern. Buttressing not a character. 100 per cent evergreen, leaves simple, mesophyllous, leathery, with epiphyllae. Dense herbaceous ground vegetation. Tree flora extremely poor." (Beard, 1946, p. 42).

On the summit of isolated Morne Bleu, three-fourths of a mile northeast of the Blanchisseuse Road, a small patch of Elfín Woodland is reported, with characteristics typical of this formation: "Temperate climatic conditions. Evaporating ability of the air high to very high. No seasonal drought. Moisture very abundant due to almost continuous precipitation and/or condensation, but possibly not entirely available due to lowered temperature . . . Stunted gnarled thicket, 15-25 ft. in height of stilt-rooted, fleshy-leaved trees with long straggling branches, festooned with moss and lichen. Canopy formed at 6-10 ft. by an under story of tree-ferns and small palms. Flora extremely limited." (Beard, 1946, p. 42).

Beyond the pass, on the north slopes of the Northern Range, the general succession is repeated. Proceeding north and down, first comes Lower Montane Rain Forest, then Deciduous Seasonal and Evergreen Seasonal. Finally, instead of savanna near the coast, is found a kind of thorn woodland, then patches of mangrove marsh and, ultimately, the sand and rocks of the littoral zone. These complete the succession of climax zones.

However, an extremely important part of the valley's zonation is occupied by cultivated land of several kinds. Of primary importance is the cacao land, shaded by tall *Erythrina* trees. It occupies roughly the middle of the valley, from the Arima Wood Reserve on the south to the beginning of the national Forest Reserve on the heights of the west, north and east. Since much of this land has not been well tended, agriculturally speaking, it forms an excellent habitat for many kinds of wild life. In the valley are also small areas devoted to citrus,

tonka and nutmegs, all of which protect the soil and are at the same time good cover for animal life.

Hillside field crops, including bananas, yams, tomatoes and corn, are grown on small plots which after two or three seasons are allowed to revert temporarily or semi-permanently to wasteland. The subsequent succession of weeds, bushes and *Cecropia* and other short-lived trees has not yet been studied floristically in the colony (Beard, 1946, p. 139 ff.). As usual, these areas of abandoned cultivation, when supported as they are here by adequate climax forest, are rich locations for animal life. This agriculturally ruinous practice of shifting cultivation is not, fortunately, followed extensively in the valley. Furthermore, the government is trying to discourage the system, both by education and by continuing to purchase agriculturally unsuitable lands for the government reserves.

On the northern coast are extensive coconut plantations which, as usual, hold little of general biological interest.

#### V. BOTANY

The floristic composition of the Arima Valley may, from the point of view of practical ecology, be thought of in three major divisions. These are, first, the dominant undisturbed Lower Montane Rain Forest; second, the flora of the cultivated tree-crop areas, particularly cacao and citrus; and, third, that of the open areas, confined to forest edges, abandoned clearings and trails.

According to Beard (1946, p. 112), the commonest trees of the Lower Montane Rain Forest are as follows, in order of their general abundance: Canopy Layer—bois gris (*Licania ternatensis*), mahoe (*Sterculia caribaea*), serrette (*Byrsonima spicata*), wild cacao (*Licania biglandulosa*) and wild kaimit (*Micropholis cruegeriana*). Lower Story—carimbo (*Guarea glabra* Vahl), niaura (*Calliandra guildingii*), bois l'ail (*Cassipourea latifolia*), wild calabash (*Tabebuia stenocalyx*) and red mangué (*Marila grandiflora*). He continues "The diagnostic species are *Sterculia* and *L. biglandulosa* in association with either *L. ternatensis* or *Byrsonima*; the last two species are almost never both abundant together, the former being dominant on north and east aspects and the moist sites generally, and the latter frequently on the drier south and west aspects." Two palms, *Bactris broadwayi* and *Prestoea pubigera*, are occasional. Deciduous trees are practically absent.

Fortunately for ecological diversity in the valley, the more southern ridges are covered, as has been said, by a transition forest with seasonal

characteristics. Here in the dry season its boundaries can be detected from Simla by waves of suddenly, and usually briefly, leafless trees. Here are found many trees typical of lowland and foothill seasonal forest. Although a few of these, such as the hogplum and poui, occur sporadically on the lower slopes of the lower montane region, they are not characteristic there. These seasonal forest trees include silk cotton (*Ceiba occidentalis*), bois d'orme (*Guazuma ulmifolia*), incense (*Protium guianense*), cedar (*Cedrela mexicana*), hogplum (*Spondias mombin*), purpleheart (*Peltogyne porphyrocardia*), yellow olivier (*Buchenavia capitata*), white olivier (*Terminalia amazonia*), cypre (*Cordia alliodora*), poui (*Tabebuia serratifolia*) sandbox (*Hura crepitans*), figuier (*Ficus taboganus*) and moussara (*Brosimum alicastrum*). The cocorite palm (*Maximiliana elegans*) also occurs occasionally in the foothills. Melastomaceae is an important under story family in all the local forests.

The tree-crops of the cultivated areas, principally cacao, citrus and tonka, form the dominant characteristics in habitats created by and for them. The citrus is, of course, particularly attractive to many kinds of wild life, from bees to bats. However, of special importance ecologically is the mountain immortelle (*Erythrina micropteryx*), naturalized from Peru, which was originally planted as shade for the cacao. These great emergents have become one of the most characteristic components of the valley, forming the principal habitat of numerous plants and animals. Bromeliads, orchids, night-blooming cereus, termites, beetles, lepidopterous caterpillars, ants, frogs, lizards, snakes, hummingbirds, caciques, squirrels and silky anteaters are among the diverse groups which find food, shelter or both in this Peruvian species. Since the trees never receive any attention from the cacao cultivators, save to be cut down when they become weakened and hence a danger to the crop, they remain a rich source of wild life, even in the few estates which are carefully cultivated. A great deal of cacao in the valley is not consistently well brushed, however, but has been allowed to revert to wilderness. In these areas, and to a lesser extent in all estates, certain quick-growing flowering plants, such as black rod (*Pachystachys coccinea*) and cacao lilies (*Hippeastrum equestre*) make the ground layer very attractive to hummingbirds and to many insects.

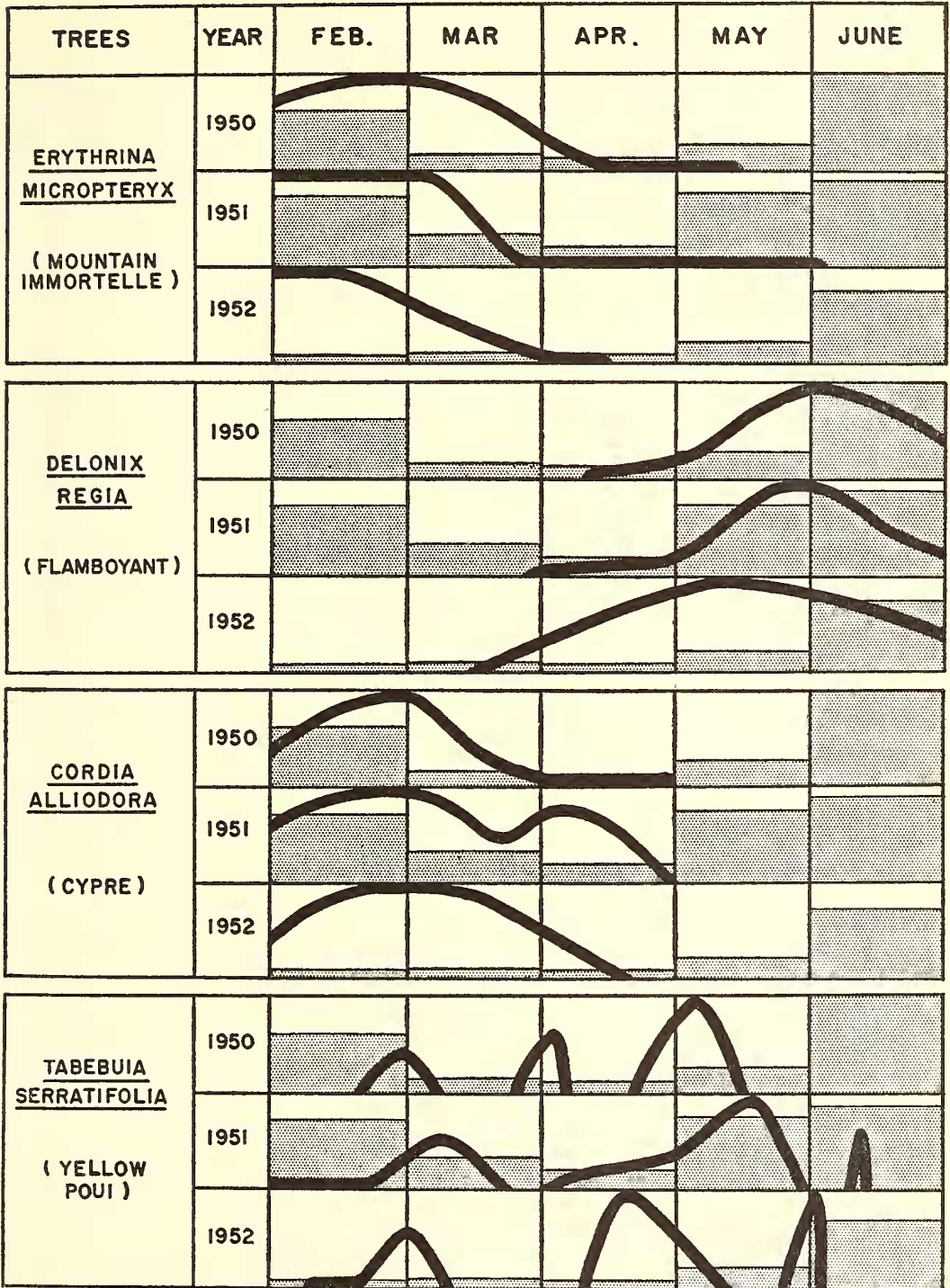
From the point of view of the general entomologist, one of the most important divisions of floristic composition is the flora of the forest edges and clearings. Here, in ample light, backed up by abundant forest, are found numerous in-

sects and birds around the wide variety of scrubby trees, shrubs and flowering herbs. The plants of these open areas of the clearings, new and old, resemble those found in similar places throughout the neotropics, with an abundance of *Cecropia peltata*, black sage (*Cordia cylindrostachya*), *Lantana camara*, *Convolvulus*, *Bidens pilosa*, and, where suitable protection is available, great stands of *Heliconia bihai*. However much of a pest these "weeds" may be considered by agriculturalists, they are highly appreciated by insects, birds, entomologists and ornithologists alike.

Typical tropical niches are found along the banks of the Arima River and its tributary streams. Here wild life is found in profusion, among the luxuriant ferns, bamboos, *Cyclanthus*, terrestrial arums, and lofty clumps of wild banana (*Heliconia*).

In the following phenological notes on the seasonal succession of bloom in the Arima valley, additional examples of the common shrubs and wildflowers will be included. The basis of choice in the plants selected for observation was purely pragmatic: all are locally common, easily observed, and, in most cases, are important to us because of their being a factor in the lives of certain animals or insects. It will be noted that many of the freely flowering herbs mentioned, such as *Bidens* and *Lantana*, are widely distributed in the tropics. As usual with such successful organisms, they have become a completely integrated part of their Trinidad environment, playing important roles in the ecology of many animals of restricted distribution; often one of their principal characteristics is a practically continuous season of bloom.

Casual observers and authorities alike, however, agree that flowering seasons of tropical species often extend throughout the year, although, of course, individual plants or branches go through at least brief resting periods. Even with this provision, however, the practice is practically unknown in the north. The swift succession of flowers in a New England meadow, for example, is famous. In the Arima valley, on the other hand, only a few trees and vines, such as *Bignonia unguis-cati*, rush through their flowering in a few days. Far more common are wild flowers that are in bloom for months, often with several nodes of peak production, or trees, such as cypre, that show blossoms on the same individual for weeks at a time. Except in localities with a severe drought, which corresponds in the tropics to the winter of the north, the chief regulators of tropical flowering seem to be internal. The details of this tropical physiology are still largely unknown.



TEXT-FIG. 5A. Flowering seasons of common plants of the Arima Valley, for five months in three successive years. The shaded areas show relative amounts of rainfall, in respect to the maximum for a monthly period, 16.4", which fell in June, 1950. Notes on flowering were made weekly, by inspection, often by more than one observer. In spite of the obviously large human factor, we consider the general results reliable, showing as they do the general tendency to considerable annual variation, long blooming seasons, and the slight direct dependence on rainfall variation. When the graph line lies flat along the bottom of the species chart, a very slight continuation of bloom is indicated. See text, p. 168, for discussion.

In the Arima Valley there is only a mild dry season, and blooming activity is intense at this time of the year, between January and June. Most of the forest trees in the valley, as in Trinidad as a whole, tend to have, however, a far shorter and more definite season than do shrubs and herbs. Schimper's data (1903, p. 252 ff.) showed that the majority of tropical woody plants which had been investigated at that time lost their leaves and flowered in the dry season. Beard's figures for Trinidad (1946, p. 5) do not agree with this conclusion. He found that one half the deciduous species flower during the rains and fruit during the dry; one-quarter flower during the dry and drop fruit during the dry; one-fourth flower during the dry and drop fruit during the rains. Hence in deciduous Trinidad trees, blossoming is about evenly divided between the two periods. However, virtually all the deciduous species do lose their leaves during the dry season. For this reason it seems possible that some earlier reports of tropical flowering may have risen from the fact that leafless trees in blossom are so much easier to see. Although there seems to be a physiological connection between the dropping of leaves and the appearance of blossoms, there is certainly also an adaptive one, in the tropics as in the north, in connection with pollenization by birds and insects. A comparative study of pollenating agents, whether wind or insects, and the releasing mechanisms of insect attraction of trees blooming in both seasons, would go far toward clearing the matter up.

The 3,600-foot cloud forest at Rancho Grande, Venezuela, (Beebe & Crane, 1947), seems to be on a much more definitely seasonal basis than the Arima Valley, showing an approach to the shorter, more circumscribed seasons of the north.

The lists below divide some common species of Arima Valley plants into three arbitrary categories, in regard to the character of their flowering season. The periods of observation were restricted to the months of February through June, 1950, 1951 and 1952.

a. Flowering season definite and annual, relatively independent of variations in seasonal drought. (Note: Principal flowering months in parentheses; in general, flowering begins and ends in the preceding and following month, respectively).

Trees: *Swietenia macrophylla* (April); *Spondias mombin* (April); *Erythrina micropteryx* (January-March; Text-fig. 5A); *Delonix regia* (May-June; Text-fig. 5A); *Albizzia caribaea* (April); *Samanea saman* (April); *Cordia alliodora* (Feb.-March or April; Text fig. 5A); *Tab-*

*ebuia pentaphylla* (sporadic, March-May); *Tabebuia serratifolia* (sporadic, March-June; Text-fig. 5A).

Plants other than trees: *Epidendrum fragrans* (April-June); *Oncidium luridum* (March; in 1952 a second crest in May); *Begonia* spp. (Feb.-March); Melastomaceae, numerous gen. et spp. with various moderately well-defined flowering seasons; *Bignonia unguis-cati* (early May).

b. Flowering constant or at frequent intervals, the low ebb definitely correlated with time and degree of seasonal drought.

Tree: *Cordia cylindrostachya*.

Plants other than trees: *Spathiphyllum canifolium*, *Cipura martinicensis* (Text-fig. 5B); *Mimosa pudica*; *Desmodium* spp.; *Ipomoea* spp.; *Lantana camara* (Text-fig. 5B); *Browallia americana* (Text-fig. 5C); *Solanum stramontifolium*; *Cephaelis tomentosa*; *Hamelia erecta*; *Momordica charantia* (Text-fig. 5D); *Isostoma longiflora*.

c. Flowering constant or at frequent intervals, the resting periods rather irregular and apparently little correlated with seasonal drought.

Trees: *Warscewiczia coccinea*; *Acnistus arborescens*.

Plants other than trees: *Monstera pertusa*; *Heliconia bihai* (Text-fig. 5B); *Heliconia hirsuta*; *Costus friederichsenii*; *Costus spiralis* (Text-fig. 5B); *Piper scabnum*; *Asclepias curassivica* (Text-fig. 5B); *Tussacia pulchella* (Text-fig. 5C); *Pachystachys coccinea* (Text-fig. 5D); *Borreria verticillata*; *Centropogon surinamensis* (Text-fig. 5D); *Emilia sonchifolia*; *Bidens pilosa* (Text-fig. 5D);

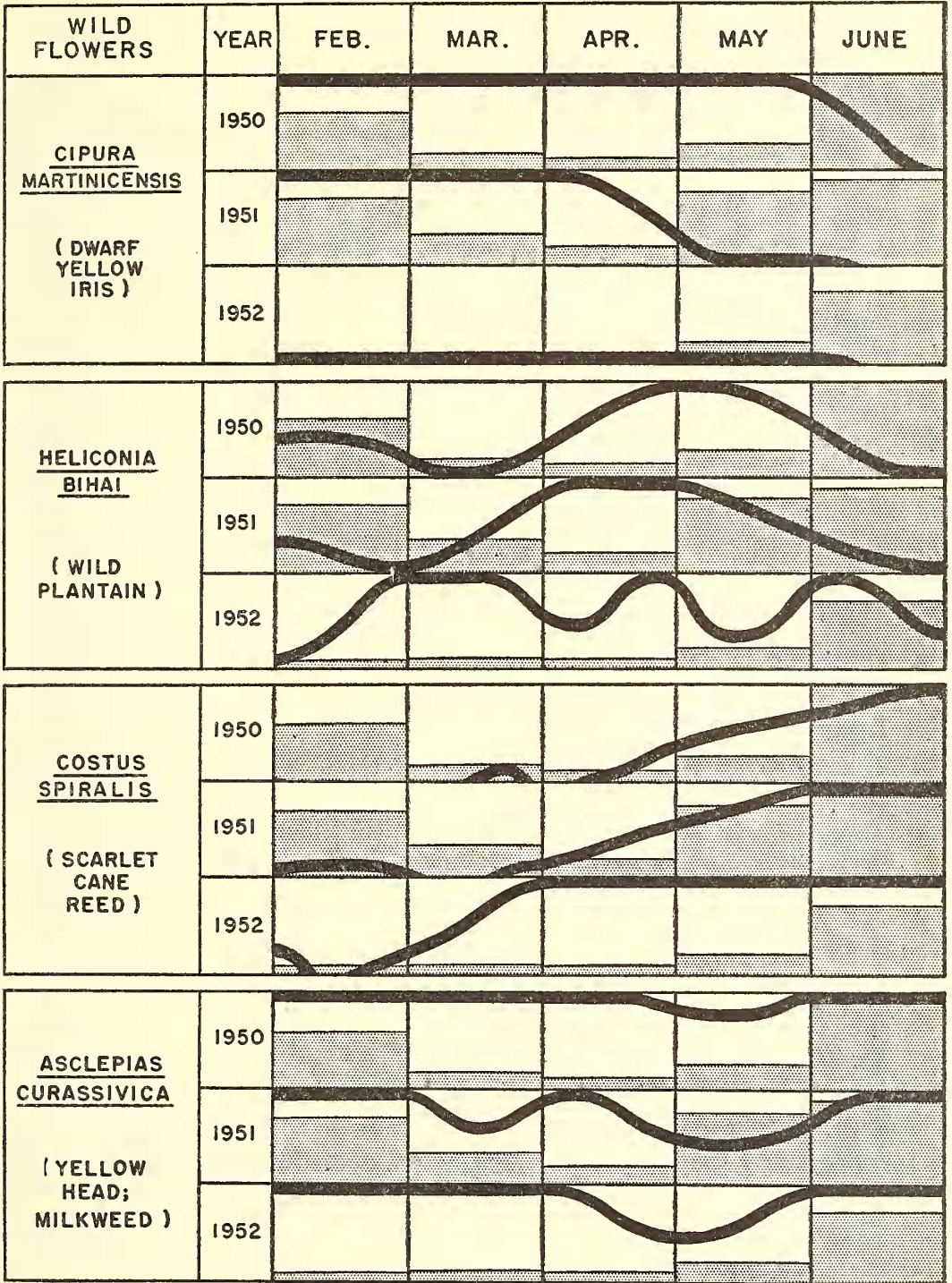
## VI. ZOOLOGY

In this preliminary paper on the ecology of the Arima Valley, there are presented notes on a few groups of invertebrates and a list of the vertebrates. The only excuse for unannotated lists is for the information of prospective workers, for whom a knowledge of mere occurrence is necessary. As such these lists are included.

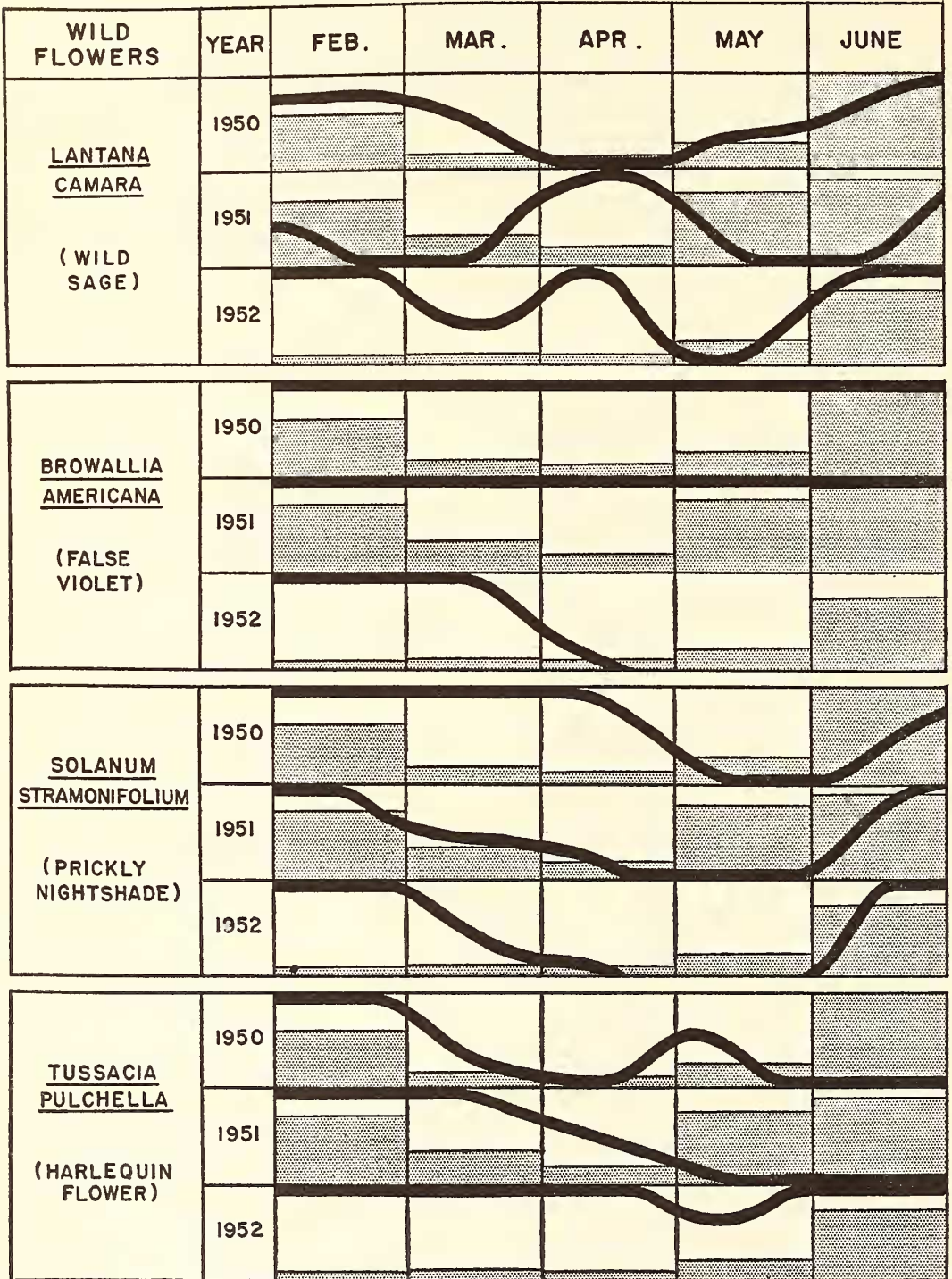
### A. Invertebrates

To condense into a few sentences even the most casual view of the tropical invertebrate fauna of Arima Valley is a feat of three-ring-circus proportions.

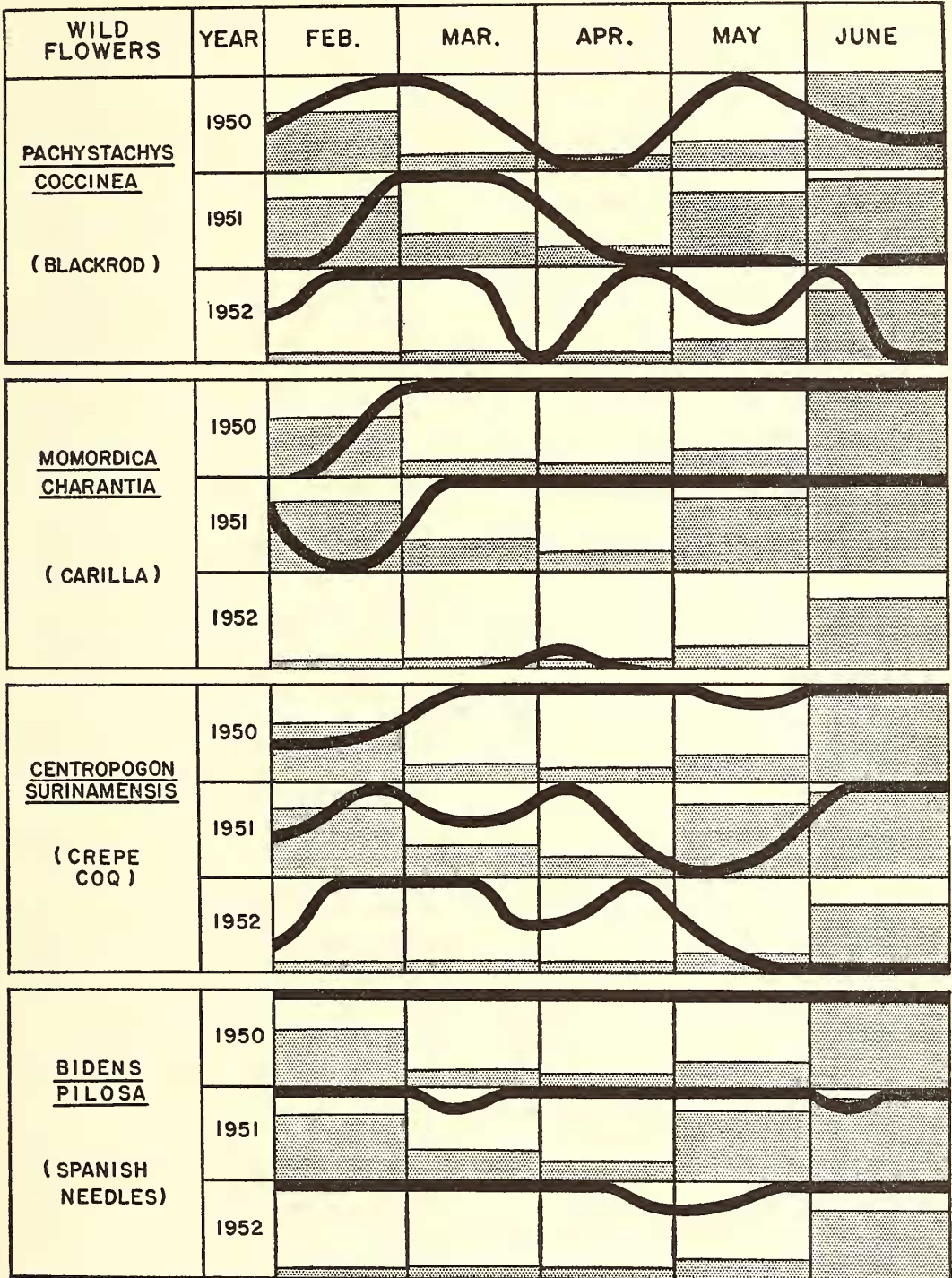
As at Rancho Grande, a protozoologist or helminthologist could spend a lifetime investigating the fauna of the natural aquaria collected in the bract-pools of bromeliads and heliconias. Land planaria are common, and mollusks, while not in great numbers, are to be found on every walk, some terrestrial, others arboreal or aquatic. Large crustacea are represented by



TEXT-FIG. 5B. For explanation, see Text-fig. 5A.



TEXT-FIG. 5C. For explanation, see Text-fig. 5A.



TEXT-FIG. 5D. For explanation, see Text-fig. 5A.

TABLE III. SYSTEMATIC LIST OF PLANTS MENTIONED IN THE TEXT\*

A. TREES	
Dilleniaceae	Rosaceae
<i>Curatella americana</i> L. Rough Leaf; Chaparro; Chaparral	<i>Licania biglandulosa</i> Griseb. Wild Debase; Wild Cacao; Wild Gasparee
Guttiferae	<i>Licania ternatensis</i> Hook.f. Bois Gris; Cassé
<i>Marila grandiflora</i> Griseb. Cacao Mangué; Red Mangué; Wild Cacao	Rhizophoraceae
Bombacaceae	<i>Cassipourea latifolia</i> Alston. Bois l'Ail; Garlic Wood
<i>Ceiba occidentalis</i> (Spreng.) Burkill. Silk Cotton	Combretaceae
Sterculiaceae	<i>Buchenavia capitata</i> (Vahl) Eichl. Yellow Olivier
<i>Sterculia caribaea</i> R. Br. Mahoe	<i>Terminalia amazonia</i> (J. F. Gmel.) Exell. White Olivier
<i>Guazuma ulmifolia</i> Lam. Bois d'Orme	Lecythidaceae
Malpighiaceae	<i>Eschweilera trinitensis</i> Smith & Beard. Mountain Guatecare
<i>Byrsonima crassifolia</i> H.B.K. Serrette	Rubiaceae
<i>Byrsonima spicata</i> (Cav.) Rich. Serrette	<i>Warszewiczia coccinea</i> (Vahl) Kl. Wakamy; Wild Poinsettia
Burseraceae	Sapotaceae
<i>Protium guianense</i> (Aubl.) March. Incense	<i>Micropholis cruegeriana</i> Pierre. Wild Kaimit
Meliaceae	<i>Hura crepitans</i> L. Sandbox
<i>Guarea glabra</i> Vahl. Carimbo	Boraginaceae
<i>Cedrela mexicana</i> Roem. Cedar; Cigar Box Cedar; Spanish Cedar	<i>Cordia alliodora</i> Cham. Cypre
<i>Swietenia macrophylla</i> King. Honduras Mahogany	<i>Cordia cylindrostachya</i> R. & S. Black Sage
Anacardiaceae	Solanaceae
<i>Spondias mombin</i> L. Hog Plum	<i>Acnistus arborescens</i> Schl. Wild Tobacco
Papilionatae	Bignoniaceae
<i>Erythrina micropteryx</i> Poepp. Anauca Immortelle; Mountain Immortelle	<i>Tabebuia stenocalyx</i> Sprague & Stapf. Wild Calabash
<i>Delonix regia</i> Raf. Flamboyant; Royal Poinciana; Flame Tree	<i>Tabebuia pentaphylla</i> Hemsl. Pink Poui
Caesalpinieae	<i>Tabebuia serratifolia</i> (Vahl) Nichols. Yellow Poui
<i>Peltogyne porphyrocardia</i> Griseb. Purpleheart; Sapatere	Moraceae
Mimoseae	<i>Ficus tobagensis</i> Urb. Figuier
<i>Calliandra guildingii</i> Benth. Niauré; Niaura	<i>Brosimum alicastrum</i> Sw. Moussara
<i>Albizia caribaea</i> (Urb.) Britt. & Rose. Tantanakayo	<i>Cecropia peltata</i> L. Bois Canon; Bois Canot; Trumpet Wood
<i>Samanea saman</i> (Jacq.) Merrill. Saman; Rain Tree	Palmaceae
	<i>Bactris broadwayi</i> Bailey. Gri-gri Palm
	<i>Prestoea pubigera</i> Nichols. Prestoe Palm
	<i>Maximiliana elegans</i> Karst. Cocorite Palm
B. PLANTS OTHER THAN TREES	
Cyclanthaceae	Musaceae
<i>Cyclanthus bipartitus</i> Poit.	<i>Heliconia bihai</i> L., Swartz. Balisier; Wild Plantain; Wild Banana
Araceae	<i>Heliconia hirsuta</i> L.
<i>Monstera pertusa</i> Schott. Hurricane Plant	<i>Heliconia humilis</i> Jacq.
<i>Spathiphyllum cannifolium</i> Schott. Arum Lily	Zingiberaceae
<i>Philodendron</i> spp.	<i>Costus friederichsenii</i> Petersen. Snowy Cane Reed
Amaryllidaceae	<i>Costus spiralis</i> Rosc. Scarlet Cane Reed
<i>Hippeastrum equestre</i> (Ait.). Cacao Lily	Orchidaceae
<i>Hymenocallis tubiflora</i> Salisb. Spider Lily	<i>Epidendrum fragrans</i> Swartz. Purple Streak Orchid
Iridaceae	<i>Oncidium luridum</i> Lindl. Brown Bee Orchid
<i>Cipura martinicensis</i> Kth. Dwarf Yellow Iris	

\* Sources of identification and nomenclature: Dr. Angus Simmons; Bailey, 1947; Beard, 1946; Marshall, 1939; Williams *et al.*, 1928-1947; Williams & Williams, 1951.



TABLE III. SYSTEMATIC LIST OF PLANTS MENTIONED IN THE TEXT (Continued)

Piperaceae	Bignoniaceae
<i>Piper scabrum</i> Swartz. Pepper Bush	<i>Bignonia unguis-cati</i> L. Cat's Claw Creeper
Mimosaceae	Gesneraceae
<i>Mimosa pudica</i> L. Shame Bush; Sensitive Plant	<i>Tussacia pulchella</i> Rchb. Harlequin Flower
Papilionatae	Acanthaceae
<i>Desmodium</i> sp. Blue Pea	<i>Pachystachys coccinea</i> Ns. Blackrod; Black Stick
Begoniaceae	Rubiaceae
<i>Begonia</i> spp.	<i>Borreria verticillata</i> (L.) Meyer. White Broom
Melastomaceae. Genera et spp.	<i>Cephaelis tomentosa</i> Willd. Wild Ipecacuanha
Asclepiadaceae	<i>Hamelia erecta</i> Jacq. Wild Clove; Coral Stick
<i>Asclepias curassavica</i> L. Matak; Wild Ipecacuanha; Yellow Head; Milkweed	Cucurbitaceae
Convolvulaceae	<i>Momordica charantia</i> L. Carilla; Maiden's Blush
<i>Ipomaea</i> spp.	Campanulaceae
Verbenaceae	<i>Isotoma longiflora</i> (L.) Presl. Star Flower
<i>Lantana camara</i> L. Wild Sage	<i>Centropogon surinamensis</i> (L.) Presl. Crepe Coq; Deer Meat
Solanaceae	Compositae
<i>Browallia americana</i> L. False Violet	<i>Emilia sonchifolia</i> (L.) DC. Dwarf Thistle
<i>Solanum stramonifolium</i> Jacq. Prickly Nightshade	<i>Bidens pilosa</i> L. Railway Daisy; Spanish Needles

good-sized crayfish in the Arima River, and a single land crab, *Pseudothelphusia garmani* Rathbun.

As is usual in the tropics, various orders of Arachnoidea are common, including spiders, scorpions, whip scorpions, chelifers and harvestmen. Ticks are fortunately almost nonexistent in the valley, and mites or bête rouge are only moderately troublesome.

At least two species of *Peripatus* are not rare.

We have recorded every order of insects and there is no need to go into any detail as to the vast numbers of Insecta in the tropics. In especial abundance are the various groups of grasshoppers, including *Tropidacris* with its eight-inch spread of wings, mantids and other stick insects. Termites are less common than would be expected. Odonata are common and include *Mecistogaster*.

Hemiptera and Neuroptera are abundant and among the fulgorids is the remarkable *Lantermaria*. Coleoptera and Diptera are in their great tropical numbers, especially as regards quantities of species. Giant harlequin beetles (*Acrocinus*) are common, and the interesting, specialized lymexylonid beetle is occasionally seen. All groups of Hymenoptera are abundant, and ants are legion, but seldom troublesome and easily guarded against in the laboratory. *Eciton* and *Atta* are of course present.

Lepidoptera are optically dominant. A first walk, or five minutes at the night light will reveal the richness of species of butterflies, or of moths.

A quarter of a century ago, more than five

hundred Rhopalocera and upwards of one thousand Heterocera had been recorded from Trinidad. During our first two seasons at Simla, nightly collections at a 6' x 6' sheet a few yards from the laboratory, lighted by a 150-watt spotlight, yielded an estimated five hundred species of moths.

As a hint for important future study of relative abundance, an 8 PM census of the sheet, from February 5 to 18, gave the following consistent percentages of ten families of moths:

Pyralidae	53.2 per cent
Microlepidoptera	28
Geometridae	9
Noctuidae	8.5
Arctiidae	4
Euchromidae	3.7
Pericopidae	1.7
Notodontidae	.36
Lasiocampidae	.27

The richness in species of insect life at Simla is made very apparent in the case of three groups to which, in the first two seasons, we paid especial attention. These groups are Arctiidae and Euchromidae among the Heterocera, and Mantoidea of the Orthoptera.

Fifty species of Arctiidae moths have, up to the present, been recorded from Trinidad. Within the brief period mentioned at Simla, we took 37 species, 14 of which were identical with already recorded Trinidad species. Twenty-three of our list were new to Trinidad, some of them, doubtless, new to science as well.

Eighty-eight species of the family Euchrom-

idae have, in past years, been collected on the island. During the same two first Simla seasons we captured 42, of which 35 were common to both lists, while 8 were additions to the island fauna.

Not only are the unusual numbers taken remarkable, but also the restricted habitat in which they were found, for all the specimens of both the above families of moths were captured within the laboratory or on the lighted screen near by, all within an area whose diameter is not more than 15 yards.

Before we began our studies in the Arima Valley, ten species of mantids had been reported from all of Trinidad. Our collections, made in the valley itself, include all of those previously recorded, and five additional species, bringing the total to fifteen. All except one of these species were taken within 100 yards of Simla laboratory.

## B. Vertebrates

### FISH

Several seines have been drawn in the waters of the Arima River, and these show that the fish fauna is unexpectedly rich. In such a preliminary survey as the present there is nothing to be gained, however, by publishing so inadequate a representation of the ichthyology of the valley. Future plans include a thorough study of this vertebrate Class.

### AMPHIBIANS

Without any thorough or intensive search we have recorded 16 species of frogs and toads from Arima Valley. This is considerably more than half of the amphibian fauna known to occur in Trinidad. Every family except Pipidae is represented, and two interesting frogs, *Pipa pipa* and *Pseudis paradoxa*, appear to be absent, although the latter is found in ponds a few miles to the southeast.

Eight hylids occur in the valley, two toads, three leptodactylids, one dendrobatid and one ranid.

The list is as follows:

#### Hylidae

- Phyllomedusa burmeisteri burmeisteri*  
Boulenger
- Hyla maxima* (Laurenti)
- Hyla rubra* Daudin
- Hyla venulosa* (Laurenti)
- Hyla crepitans* Wied
- Hyla punctata* (Schneider)
- Hyla minuta* Peters
- Gastrotheca fitzgeraldi* Parker

#### Bufonidae

- Bufo marinus* (Linnaeus)
- Bufo granulosus* Spix

#### Leptodactylidae

- Eleutherodactylus urichi* (Boettger)
- Leptodactylus petersi* (Steindachner)
- Leptodactylus typhonius* (Daudin)
- Eupemphix pustulosus trinitatis* (Boulenger)

#### Dendrobatidae

- Phyllobates trinitatis* Garman

#### Ranidae

- Rana palmipes* Spix

### LIZARDS

From a total Trinidad lacertilian fauna of about 20 species, we have taken 15, or three-fourths of this number, in Arima Valley. Even the brief periods of observation devoted to lizards reveal considerable complexities of abundance and distribution. For example, *Anolis* and *Tupinambis* are rare intrusions from the southern lowlands, and *Cnemidorphorus* is confined to lower elevations of St. Pats.

The so-called luminous lizard, *Proctoporus shrevei* Parker, has been taken in some numbers near the Aripo Caves, four miles northeast of Simla.

The Arima Valley list is as follows:

#### Gekkonidae

- Thecadactylus rapicaudus* (Houttuyn)  
House Gecko  
Common
- Sphaerodactylus molei* Boettger  
Black-and-white-headed Gecko  
Common
- Gonatodes humeralis* (Guichenot)  
Orange-spotted Gecko  
Common
- Gonatodes vittatus* (Lichtenstein)  
White-banded Gecko  
Common

#### IGUANIDAE

- Anolis chrysolepis* Duméril & Bibron  
Stripe-backed Anolis  
Rare
- Plica plica* (Linnaeus)  
Spiny Tree Lizard  
Occasional
- Iguana iguana iguana* (Linnaeus)  
Iguana  
Occasional

*Polychrus marmoratus* (Linnaeus)  
Many-colored Tree Lizard  
Occasional

## TEIIDAE

*Tupinambis nigropunctatus* Spix  
Tegu  
Rare

*Cnemidophorus lemniscatus lemniscatus*  
(Linnaeus)  
Striped Runner; Foot-shaker  
Rare

*Ameiva ameiva atrigularis* Garman  
Ameiva; Large Jungle Runner  
Common

*Scolecocaurus trinitatis* Barbour  
Worm Lizard  
Occasional

## AMPHISBAENIDAE

*Amphisbaena alba* Linnaeus  
White Legless Lizard  
Occasional

*Amphisbaena fuliginosa* Linnaeus  
Black-and-white Legless Lizard  
Occasional

## SCINCIDAE

*Mabuya mabouya aenea* (Gray)  
Trinidad Skink  
Rare

## SNAKES

Trinidad has an ophidian fauna of about 38 species. Seventy per cent of these, or 27 snakes, have been taken in Arima Valley. The present collection is, for the most part, the result of the activities of native men and boys in the valley, and represents only such casual records. Of the poisonous snakes, bushmasters, *Lachesis m. muta*, are considerably more numerous than ferdelance, *Bothrops a. atrox*. Coral snakes are more rare. *Boa constructors* are not uncommon but none reach a large size.

The following are all Arima Valley records:

## Leptotyphlopidae

*Leptotyphlops tenella* Klauber

## Boidae

*Epicrates cenchris cenchris* (Linnaeus)  
*Corallus enydris cookii* Gray  
*Boa constrictor constrictor* Linnaeus

## Colubridae

*Ninia atrata atrata* (Hallowell)  
*Sibon nebulatus* (Linnaeus)  
*Pseustes sulphureus sulphureus* (Wagler)  
*Pseustes poecilonotus polylepis* (Peters)

*Spilotes pullatus pullatus* (Linnaeus)  
*Drymarchon corais corais* (Boie)  
*Chironius carinatus* (Linnaeus)  
*Thalerophis richardi coeruleodorsus* (Oliver)  
*Leimadophis melanotus* (Shaw)  
*Leimadophis reginae reginae* (Linnaeus)  
*Liophis cobella cobella* (Linnaeus)  
*Atractus trilineatus* Wagler  
*Leptodira annulata annulata* (Linnaeus)  
*Imantodes cenchoa cenchoa* (Linnaeus)  
*Oxyrhopus petola petola* (Linnaeus)  
*Pseudoboa neuwiedi* (Guenther)  
*Oxybelis fulgidus* (Daudin)  
*Oxybelis aeneus aeneus* (Wagler)  
*Tantilla melanocephala* (Linnaeus)

## Elapidae

*Micrurus circinalis* (Duméril & Bibron)  
*Micrurus lemniscatus* (Linnaeus)

## Viperidae

*Lachesis muta muta* (Linnaeus)  
*Bothrops atrox atrox* (Linnaeus)

## CROCODILES AND TURTLES

*Caiman crocodilus crocodilus* (Linnaeus)  
Spectacled Caiman

Two caimans, about two feet in length, have been reported from the Arima River near the head of the valley.

*Testudo denticulata* Linnaeus  
*Geoemyda punctularia* (Daudin)

These two species of turtles are not rare in the valley.

## BIRDS

The period of field work in the Arima Valley, up to the present time, includes the five months of February to June inclusive, throughout three years. During this time 164 species of birds have come under observation, belonging to 14 orders and 41 families. The percentage of this avifauna of the Arima Valley compares favorably with that of the entire island.

The carefully edited list of H. Radclyffe Roberts includes 320 species, of which 230 are land birds (Roberts, 1934, List of Trinidad birds with field notes, *Tropical Agriculture*, 11, No. 4). Our Arima Valley list thus amounts to 70 per cent of the island's land birds. Correlated with this we must remember that our study area is less than 1/170th of the square mileage of Trinidad.

All details of life histories would be out of place in this preliminary ecological report, and are reserved for future monographic treatment. However, I have added references of monthly breeding records taken from Belcher & Smook-

er's "Birds of the Colony of Trinidad and Tobago" (*Ibis*, Thirteenth Series, 4, 5, 6, 7; 1934-1937), together with my own observations.

#### Tinamidae

A single species of tinamou occurs in Trinidad and this is a common resident in Arima Valley. It is much more often heard than seen.

*Crypturellus soui andrei* (Brabourne & Chubb)  
Pileated Tinamou (May and October)

#### Fregatidae

We have several records of frigatebirds over the valley, straying south from the sea.

*Fregata magnificens* Mathews  
Frigatebird (March)

#### Cathartidae

Two species, the turkey and black vultures, are common in the valley, as elsewhere in Trinidad. The king vulture seems to have become extinct.

*Cathartes aura ruficollis* Spix  
Turkey Vulture (November to March)  
*Coragyps atratus* (Beckstein)  
Black Vulture (November to February)

#### Accipitridae

Eight out of 17 species of this family, kites, hawks and eagles, have been observed in the valley.

*Elanoides forficatus yetapa* (Vieillot)  
Swallow-tailed Kite  
*Ictinia plumbea* (Gmelin)  
Plumbeus Kite (March and April)  
*Buteo albicaudatus colonus* Berlepsch  
White-tailed Buzzard (March and April)  
*Buteo nitidus nitidus* (Latham)  
Shining Buzzard Hawk (March and April)  
*Leucopternis albicollis albicollis* (Latham)  
White-collared Hawk  
*Buteogallus anthracinus* (Lichtenstein)  
Mexican Black Hawk (March to July)  
*Urubitinga urubitinga urubitinga* (Gmelin)  
Brazilian Eagle (May)  
*Spizaëtus o. ornatus* (Daudin)  
Crested Hawk-eagle

#### Pandionidae

The osprey occurs as a migrant.  
*Pandion haliaëtus carolinensis* (Gmelin)  
American Osprey

#### Falconidae

Three out of five falcons occur, including the migrant duckhawk.

*Falco peregrinus anatum* Bonaparte  
Duckhawk

*Falco ruficularis ruficularis* Daudin  
Trinidad Bat Falcon (February and July)

*Falco fusco-caerulescens fusco-caerulescens*  
Vieillot  
Black-bellied Falcon (April)

#### Scolopacidae

The migrant spotted and solitary sandpipers represent this family in Arima Valley.

*Tringa solitaria solitaria* Wilson  
Solitary Sandpiper  
*Actitis macularia* (Linnaeus)  
Spotted Sandpiper

#### Columbidae

Six out of 11 Trinidad pigeons live in the valley. The most common is the gray-fronted dove.

*Leptotila rufaxilla hellmayri* Chapman  
Gray-fronted Dove (January to July)  
*Oreopeleia montana montana* (Linnaeus)  
Red Dove (May)  
*Oreopeleia linearis trinitatis* (Hellmayr & Seilern)  
Mountain Dove (February)  
*Columba speciosa* Gmelin  
Splendid Pigeon (March and April)  
*Columbigallina minuta minuta* (Linnaeus)  
Gray Ground Dove (March to August)  
*Columbigallina talpacoti rufipennis* (Bonaparte)  
Rufous-winged Ground Dove (May to December)

#### Cuculidae

Ten species of cuckoos are found in Trinidad, of which seven occur in our study area. Among these are migrating yellow-billed cuckoos, squirrel cuckoos and three species of anis.

*Coccyzus americanus americanus* (Linnaeus)  
Yellow-billed Cuckoo  
*Piaya cayana insulana* Hellmayr  
Squirrel Cuckoo (July)  
*Piaya minuta minuta* (Vieillot)  
Little Cuckoo (July)  
*Tapera naevia naevia* (Linnaeus)  
Brown Cuckoo (June to August)  
*Crotophaga major* Gmelin  
Greater Ani (August to November)  
*Crotophaga ani* Linnaeus  
Common Ani (January to September)  
*Crotophaga sulcirostris sulcirostris* Swainson  
Groove-billed Ani

## Psittacidae

Four species of parrots and parakeets inhabit Arima Valley. The most abundant breeder is the seven-colored parakeet.

*Forpus passerinus viridissimus* (Lafresnaye)  
Blue-winged Parakeet (April and May)

*Amazona amazonica tobagensis* Cory  
Orange-winged Amazon Parrot (May and June)

*Pionus menstruus* (Linnaeus)  
Blue-headed Parakeet

*Touit batavica* (Boddaert)  
Seven-colored Parakeet (February and March)

## Tytonidae

The barn owl is found at Simla.

*Tyto alba hellmayri* Griscom & Greenway  
Barn Owl (February to June)

## Strigidae

Three out of four owls, including screech and pygmy owls, occur.

*Otus choliba crucigerus* (Spix)  
Screech Owl (April)

*Ciccaba virgata virgata* (Cassin)  
Variable Wood Owl (April and May)

*Glaucidium brasilianum phalaenoides* (Daudin)  
Trinidad Pygmy Owl (February to April)

## Steatornithidae

The guacharo or oilbird inhabits a cave near the head of the valley.

*Steatornis caripensis* Humboldt  
Oilbird (January to April)

## Nyctiibidae

Poor-me-ones are few in number but often heard calling in the valley.

*Nyctibius griseus griseus* (Gmelin)  
Poor-me-one (April to August)

## Caprimulgidae

Two out of five Trinidad nighthawks are found in the valley. The white-necked is the most common.

*Nyctidromus albicollis albicollis* (Gmelin)  
White-necked Nighthawk (February to July)

*Podager nacunda minor* Cory  
Nacunda Nighthawk (April)

## Micropodidae

Six out of seven Trinidad swifts have been recorded from our valley. The most common is the short-tailed swift, the most aberrant the feather-toed palm swift.

*Chaetura spinicauda spinicauda* (Temminck)  
Spine-tailed Swift.

*Chaetura cinereiventris lawrencei* Ridgway  
Lawrence's Swift

*Chaetura brachyura brachyura* (Jardine)  
Short-tailed Swift (June)

*Chaeturellus rutilus brunneitorques*  
(Lafresnaye)  
Rufous-collared Swift (September and November)

*Streptoprocne zonaris albicincta* (Cabanis)  
Banded Swift

*Panyptila cayennensis* (Gmelin)  
Feather-toed Palm Swift (April)

## Trochilidae

Fifteen of the 16 of the hummingbirds found on the island inhabit the valley. Eight of these are common or abundant and have been found nesting.

*Glaucis hirsuta insularum* Hellmayr & Seilern  
Hairy Hermit (February)

*Phaethornis guy guy* (Lesson)  
Guy's Hermit

*Phaethornis longuemareus longuemareus*  
(Lesson)

Longuemare's Hermit (March to May)

*Florisuga mellivora mellivora* (Linnaeus)  
Great Jacobin

*Colibri delphinae* (Lesson)  
Brown Violet-ear (February)

*Anthacothorax viridigula* (Boddaert)  
Green-throated Mango (January)

*Anthacothorax nigricollis nigricollis* (Vieillot)  
Violet-tailed Mango (April)

*Chrysolampis mosquitus* (Linnaeus)  
Ruby and Topaz Hummingbird (January to March)

*Lophornis ornata* (Boddaert)  
Tufted Coquette (February)

*Chlorestes notatus notatus* (C. Reichenbach)  
Blue-chinned Sapphire (March)

*Chlorostilbon canivetii caribaeus* Lawrence  
Lawrence's Emerald (May)

*Polytmus guainumbi guainumbi* (Pallas)  
Golden-throated Hummingbird (August)

*Amazilia chionopectus chionopectus* (Gould)  
White-breasted Emerald (March)

*Amazilia tobaci erythronotus* (Lesson)  
Common Emerald (February)

*Helioaster longirostris longirostris* (Audebert & Vieillot)

Long-billed Star-throat

## Trogonidae

All three Trinidad trogons live in Arima Valley. By far the most common as to numbers and breeding is the lesser yellow-bellied trogon.

- Trogon strigilatus strigilatus* Linnaeus  
Greater Yellow-bellied Trogon (April to July)  
*Trogon violaceus violaceus* Gmelin  
Lesser Yellow-bellied Trogon (April to July)  
*Trogonurus collaris collaris* Vieillot  
Collared Trogon; Red-bellied Trogon (April to July)

## Alcedinidae

The little green kingfisher is the only species known to occur.

- Chloroceryle americana croteta* Wetmore  
Little Green Kingfisher (March to October)

## Momotidae

The single species of Trinidad motmot is often heard and seen.

- Momotus momota bahamensis* (Swainson)  
King of the Woods (May)

## Galbulidae

Trinidad possesses a single species of jacamar and it is a resident in Arima Valley.

- Galbula ruficauda ruficauda* Cuvier  
Jacamar (April to June)

## Ramphastidae

The single species of Trinidad toucan is found in the valley.

- Ramphastos vitellinus vitellinus* Lichtenstein  
Sulphur-and-white-breasted Toucan (June)

## Picidae

Four out of the five Trinidad woodpeckers live in Arima Valley. None are abundant.

- Piculus rubiginosus trinitatis* (Ridgway)  
Trinidad Green Woodpecker (May and June)  
*Celeus elegans leotaudi* Hellmayr  
Yellow-headed Woodpecker (April and May)  
*Dryocopus lineatus lineatus* (Linnaeus)  
Big Red-headed Woodpecker (April)  
*Veniliornis kirkii kirkii* (Malherbe)  
Little Red-headed Woodpecker (February)

## Dendrocolaptidae

Two out of the four Trinidad woodcreepers (I prefer this term to the more usual but wholly inappropriate "woodhewers") have been recorded. They are not uncommon in the cacao plantations and more open jungle.

- Dendrocincla fuliginosa meruloides*  
(Lafresnaye)  
Northern Red-vented Woodhewer (June and July)

- Xiphorhynchus guttatus susurrans* (Jardine)  
Cocoa Woodhewer (April to June)

## Furnariidae

Four out of five species live in the valley, including both of the spine-tails with their great stick nests.

- Synallaxis albescens trinitatis* Zimmer  
White-throated Spine-tail (June to December)  
*Synallaxis cinnamonea carri* Chapman  
Trinidad Spine-tail (June to September)  
*Xenops rutilans heterurus* Cabanis & Heine  
Red-tailed Recurved-bill (May)  
*Scleurus albigularis albigularis* Sclater & Salvin  
White-throated Leaf-scraper (October to May)

## Formicardiidae

Trinidad possesses 11 species of antbirds. Eight inhabit Arima Valley, and the notes of three, *Taraba*, *Thamnophilus* and *Grallaria*, are characteristic of the woods.

- Taraba major semifasciatus* (Cabanis)  
Para Bush-shrike (May to July)  
*Thamnophilus doliatus fraterculus* Berlepsch & Hartert  
White-barred Bush-shrike (almost every month)  
*Dysithmanus mentalis andrei* Hellmayr  
Andre's Antbird  
*Myrmotherula axillaris axillaris* (Vieillot)  
White-flanked Antbird (July)  
*Myrmeciza longipes longipes* (Swainson)  
Small Antbird (March to May)  
*Formicarius analis saturatus* Ridgway  
Rufous-necked Ant-thrush (March)  
*Grallaria guatemalensis aripoensis* Hellmayr & Seilern  
Trinidad Long-legged Ant-thrush (May)

## Cotingidae

Four out of five cotingas occur in the valley. The mossy-throated bellbird is by far the most notable, a bird so often heard and not seen, and whose nest and eggs are still a mystery.

- Attila spadiceus spadiceus* (Gmelin)  
Trinidad Attila (April)  
*Pachyrhamphus polychopterus tristis* (Kaup)  
Black Thick-bill (May to October)  
*Tityra cayana cayana* (Linnaeus)  
Cayenne Tityra (March)  
*Procnias averano carnobarba* (Cuvier)  
Mossy-throated Bellbird

## Pipridae

Both of the Trinidad bright-colored manakins are not uncommon.

*Pipra erythrocephala erythrocephala* (Linnaeus)  
Golden-headed Manakin (February and April)

*Manacus manacus trinitatis* (Hartert)  
White-breasted Manakin (January to May)

## Tyrannidae

Out of 33 Trinidad flycatchers, 21 have been found in Arima Valley. The commonest are the gray-breasted kingbirds and the kiskadees. The olive-sided flycatcher is a new migrant record for Trinidad.

*Muscivora tyrannus tyrannus* (Linnaeus)  
Swallow-tailed Flycatcher

*Tyrannus melancholicus chloronotus* Berlepsch  
Gray-headed Kingbird (January to July)

*Tyrannus dominicensis* subsp. ?  
White-breasted Kingbird (May to September)

*Empidonomus varius septentrionalis* Todd  
Guiana Streaked Flycatcher

*Legatus leucophaius leucophaius* (Vieillot)  
Little White-necked Flycatcher (April)

*Myiodynastes maculatus tobagensis* Zimmer  
Streaked Flycatcher (May to July)

*Megarynchus pitangua pitangua* (Linnaeus)  
Broad-billed Kiskadee (April and May)

*Pitangus sulphuratus trinitatis* Hellmayr  
Kiskadee (December to May)

*Myiarchus tyrannulus tyrannulus* (P.L.S. Muller)  
Rusty-tailed Flycatcher (April to August)

*Myiarchus tuberculifer tuberculifer* (Lafresnaye & d'Orbigny)  
Dark-capped Flycatcher (April to June)

*Contopus cinereus bogotensis* (Bonaparte)  
Caribbean Wood-pewee (May and June)

*Empidonax euleri lawrencei* Allen  
Lawrence's Pewee (April to July)

*Myiophobus fasciatus fasciatus* (P.L.S. Muller)  
Little Brown Flycatcher (April to August)

*Tolmomyas sulphurescens exortivus* (Bangs)  
Sulphury Flat-bill (April to July)

*Myiornis ecaudatus miserabilis* (Chubb)  
Short-tailed Pygmy Tyrant

*Elaenia flavogaster flavogaster* (Thunberg)  
Yellow-vented Crested Flycatcher (February to October)

*Nuttallornis borealis* (Swainson)  
Olive-sided Flycatcher

*Camptostoma obsoletum venezuelae* Zimmer  
Little Flycatcher (July)

*Mionectes olivaceus venezuelensis* Ridgway  
Olivaceous Flycatcher (February to June)

*Pipromorpha oleaginea pallidiventris* (Hellmayr)  
Oily Flycatcher (February to May)

*Leptopogon superciliaris pariae* Phelps & Phelps  
Eye-browed Flycatcher (February to July)

## Hirundinidae

Three out of five Trinidad swallows live in the valley.

*Hirundo rustica erythrogaster* Boddaert  
Barn Swallow

*Progne chalybea chalybea* (Gmelin)  
Gray-breasted Martin (April and May)

*Stelgidopteryx ruficolis aequalis* Bangs  
Rough-winged Swallow (April to June)

## Troglodytidae

Both Trinidad species are common in the valley. At Simla Laboratory, both the house and jungle wrens nested within 30 feet of each other.

*Troglodytes musculus clarus* Berlepsch & Hartert  
Venezuelan House Wren (Almost every month)

*Thryothorus rutilus rutilus* Vieillot  
Bar-throated Jungle Wren (January to September)

## Mimidae

The mockingbird is a rare stray from the lowland savannas.

*Mimus gilvus tobagensis* Dalmas  
Mockingbird (February to July)

## Sylviidae

This family is represented only by the Trinidad ant-wren.

*Ramphocaenus melanurus trinitatis* Lesson  
Trinidad Ant-wren

## Turdidae

Four out of the six Trinidad thrushes are found in Arima Valley.

*Platycichla flavipes melanopleura* (Sharpe)  
Yellow-footed Thrush (May and June)

*Turdus albicollis phaeopygoides* Seebohm  
White-throated Thrush (January to June)

*Turdus nudigenis nudigenis* Lafresnaye  
Bare-cheeked Thrush (May to September)

*Turdus fumigatus aquilonalis* (Cherrie)  
Sabian Thrush (April to July)

## Vireonidae

Three out of four Trinidad species of vireos

inhabit Arima Valley. The song of one, the yellow-breasted shrike-vireo, is perhaps the most persistent and characteristic bird song of the valley.

- Vireo altiloquus altiloquus* (Vieillot)  
Antillean Vireo (June)
- Vireo olivaceus vividior* Hellmayr & Seilern  
Chivi Vireo (May to July)
- Hylophilus aurantiifrons saturatus* (Hellmayr)  
Golden-fronted Wood-bird (April to August)
- Cyclarhis gujanensis flavipectus* Sclater  
Yellow-breasted Shrike-vireo (March)

#### Coerebidae

Five out of six Trinidad honeycreepers are found in our study area.

- Coereba flaveola luteola* (Cabanis)  
Common Honeycreeper (almost every month)
- Cyanerpes caerulea trinitatis* (Bonaparte)  
Purple Honeycreeper
- Cyanerpes cyaneus cyaneus* (Linnaeus)  
Blue Honeycreeper (July)
- Chlorophanes spiza spiza* (Linnaeus)  
Green Honeycreeper (June)
- Dacnis cayana cayana* (Linnaeus)  
Turquoise Honeycreeper (June)

#### Parulidae

All eight Trinidad warblers occur in the valley. Five of these are migrants from North America.

- Basileuterus culicivorus olivascens* Chapman  
Olive Warbler (April to July)
- Dendroica petechia aestiva* (Gmelin)  
Yellow Warbler
- Dendroica striata* (Forster)  
Black-poll Warbler
- Geothlypis aequinoctialis aequinoctialis* (Gmelin)  
South American Yellow-throat
- Parula pitiayumi elegans* (Todd)  
Elegant Warbler (June and July)
- Protonotaria citrea* (Boddaert)  
Prothonotary Warbler
- Seiurus noveboracensis noveboracensis* (Gmelin)  
Waterthrush
- Setophaga ruticilla ruticilla* (Linnaeus)  
American Redstart

#### Icteridae

Trinidad possesses eight species of this family. The only ones absent from Arima Valley are the yellow-headed *Agelaius*, and red-breasted *Leistes*, blackbirds, which are confined to the

lowland savanna marshes. They have been seen within two or three miles of our southern valley boundaries.

- Cacicus cela cela* (Linnaeus)  
Yellow-backed Cacique (January to June)
- Holoquiscalus lugubris lugubris* (Swainson)  
Boat-tailed Grackle (May to September)
- Icterus nigrogularis trinitatis* Hartert  
Black-throated Oriole (April to August)
- Molothrus bonariensis minimus* (Dalmás)  
Glossy Cowbird
- Psarocolius decumanus insularis* (Dalmás)  
Great-crested Cacique (January onward)
- Psomocolax oryzivorus oryzivorus* (Gmelin)  
Rice Grackle (January to March)

#### Tersinidae

We have a single record of this rare swallow-tanager from Arima Valley, although it has been found breeding on Morne Bleu.

- Tersina viridis occidentalis* (Sclater)  
Swallow Flycatcher (June)

#### Thraupidae

Trinidad possesses 15 tanagers, of which only two have not been found in the valley.

- Habia rubica rubra* (Vieillot)  
Cardinal Ant-tanager (April)
- Piranga rubra rubra* (Linnaeus)  
Summer Tanager
- Ramphocelus carbo magnirostris* Lafresnaye  
Silverbeak Tanager (March to August)
- Tachyphonus luctuosus flaviventris* (Sclater)  
Lesser White-shouldered Tanager (April and June)
- Tachyphonus rufus* (Boddaert)  
Greater White-shouldered Tanager (February to August)
- Tangara gyrola viridissima* (Lafresnaye)  
Red-headed Tanager (March and May)
- Tangara mexicana vieilloti* (Sclater)  
Sulphur-bellied Tanager (May)
- Tangara chrysophrys trinitatis* (Todd)  
Larger Spotted Tanager
- Tanagra trinitatis* (Strickland)  
Yellow-capped Euphonia (April)
- Tanagra violacea violacea* (Linnaeus)  
Yellow-throated Euphonia (March to May)
- Thraupis cyanocephala busingi* (Hellmayr & Seilern)  
Blue-headed Tanager (June)
- Thraupis palmarum melanoptera* (Sclater)  
Palm Tanager (May and June)
- Thraupis virens nesophila* Riley  
Blue Tanager (February to July)



## Fringillidae

Thirteen sparrows and finches inhabit Trinidad. Of these, three have not been recorded from Arima Valley.

- Saltator albicollis striatipectus* Lafresnaye  
Stripe-breasted Saltator (May to July)
- Saltator coerulescens brewsteri* Bangs & Penard  
Gray-breasted Saltator (April to October)
- Cyanocompsa cyanooides rothschildii* (Bartlett) subsp.?  
Guiana Blue Grosbeak
- Volatinia jacarina splendens* (Vieillot)  
Glossy Grassquit (Every month)
- Spermophila bouvronoides* Lesson  
Lesson's Seedeater (April to September)
- Spermophila nigricollis nigricollis* (Vieillot)  
Yellow-bellied Seedeater (May to August)
- Spermophila minuta minuta* (Linnaeus)  
Pygmy Seedeater (April to July)
- Spermophila intermedia intermedia* (Cabanis)  
Gray Seedeater (May to September)
- Oryzoborus crassirostris* (Gmelin)  
Thick-billed Seed-finch (April to July)
- Oryzoborus angolensis torridus* (Scopoli)  
Small-billed Seed-finch (February to August)

## MAMMALS

The island of Trinidad possesses 70 species of mammals. In our present work in Arima Valley we have made no special effort to collect an adequate representation of bats, rats and mice. These groups comprise 49 of Trinidad's mammalian fauna and have been omitted from the present preliminary list.

Of the remaining 21 mammals, 19 have been collected or observed in the valley; the two omissions include the very rare Carr's mouse opossum, *Marmosa carri* Allen & Chapman, of which only a half-dozen specimens are known, and the manatee, *Trichechus manatus* Linnaeus. This latter creature is not uncommon in the Oropouche River, a few miles east of our valley. The Arima River is far too narrow and shallow to accommodate an animal of such dimensions as the sea-cow.

The 19 mammals found in Arima Valley divide well-balanced habitats among them. Nine are terrestrial: armadillo, deer, peccary, aguti, paca, ocelot, raccoon, mongoose and otter. The remaining ten may be classified as arboreal: three opossums, two anteaters, squirrel, porcupine, tayra and two monkeys. Another classification reveals that six are vegetarians: deer, peccary, aguti, paca, squirrel and porcupine.

Eleven of the remainder are carnivorous, while the two monkeys must be considered omnivorous.

## MARSUPIALIA

## Didelphidae

- Didelphis marsupialis insularis* Allen  
Large Opossum  
Occasional to common
- Philander trinitatis* Thomas  
Trinidad Woolly Opossum  
Occasional
- Marmosa mitis chapmani* Thomas  
Trinidad Mouse Opossum  
Common; taken by hand and in live traps

## EDENTATA

## Myrmecophagidae

- Tamandua longicaudata* Wegner  
Tamandua  
Rare; two seen in high trees
- Cyclopes didactylus* (Linnaeus)  
Silky Anteater  
Common, but seldom seen in the daytime

## Dasypodidae

- Dasypus novemcinctus* (Linnaeus)  
Nine-banded Armadillo  
Occasionally met with in the woods

## ARTIODACTYLA

## Cervidae

- Mazama rufa* (Cuvier)  
Trinidad Deer  
Not rare, although being thinned in numbers by hunters

## Dicotylidae

- Dicotyles tajacu* (Linnaeus)  
Trinidad Peccary  
Rare; one seen and others heard near the head of the valley

## RODENTIA

## Sciuridae

- Sciurus aestuans hoffmanni* (Peters)  
Trinidad Squirrel  
Common in cacao plantations

## Dasyproctidae

- Dasyprocta aguti* (Linnaeus)  
Aguti  
Still common in spite of constant shooting
- Coelogenys paca* (Linnaeus)  
Paca  
Rare, but still seen in the deeper forests

## Cercolabidae

*Syntheres prehensilis* (Linnaeus)

Tree Porcupine

Porcupines are not uncommon but are difficult to see

## CARNIVORA

## Felidae

*Leopardus pardalis* Linnaeus

Ocelot

Occasional; three have been seen near Simla

## Procyonidae

*Procyon cancrivorus* (Cuvier)

Raccoon

Occasional

## Mustelidae

*Galictis barbata trinitatis* Thomas

Tayra

Occasional

*Lutra enudris* Cuvier

Trinidad Otter

Two otters were seen by Mr. Ray Johnson in the Arima River near the head of the valley; the only record

## Herpestidae

*Herpestes mungo* Gmelin

Mongoose

Common in all kinds of habitats

## PRIMATES

Two species of monkeys are found in Trinidad, and both occur in Arima Valley.

## Cebidae

*Cebus apella* Linnaeus

Capuchin Monkey

Almost extinct in the Northern Range; we have only three records

*Alouatta seniculus insulans* Elliot

Trinidad Howling Monkey

At least three bands of howlers frequent the valley

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## EXPLANATION OF THE PLATES

## PLATE I

FIG. 1. Contour map of the Arima and Marianne Valleys of the Northern Range, Trinidad, B.W.I. Reduced from a section of the Trinidad and Tobago Government Survey map, 1:50,000, Sheet B. Government Reserve boundaries as of 1922-1925. Since then they have been enlarged. See also Pl. V, Fig. 9.

## PLATE II

FIG. 2. Simla, the field station of the Department of Tropical Research of the New York Zoological Society, from the eastern ridge.

FIG. 3. Seining the Arima River, below Simla.

## PLATE III

FIG. 4. Simla from the southeast.

FIG. 5. Inside the laboratory at Simla.

## PLATE IV

FIG. 6. Lower Montane Rain Forest, Government Reserve, Arima Valley.

FIG. 7. Roadside, showing tree ferns. Lower Montane Rain Forest.

## PLATE V

FIG. 8. Edge of transitional type of forest, St. Patrick Estate, showing figuier (*Ficus tobagensis*) with strangler fig. Stream bed flora in foreground, including *Heliconia*, *Costus*, *Cyclanthus* and bamboo.

FIG. 9. Airplane view of Arima Valley, from the town of Arima approximately to Spring Hill Estate. Pale line is the road, which closely follows the Arima River. Arrow points to Simla.